

# Conservation Effects Assessment Project (CEAP) at the St. Joseph River Watershed, Northeast Indiana



National Soil Erosion Research Laboratory



# ARS 14 Cropland CEAP Watershed Assessment Studies



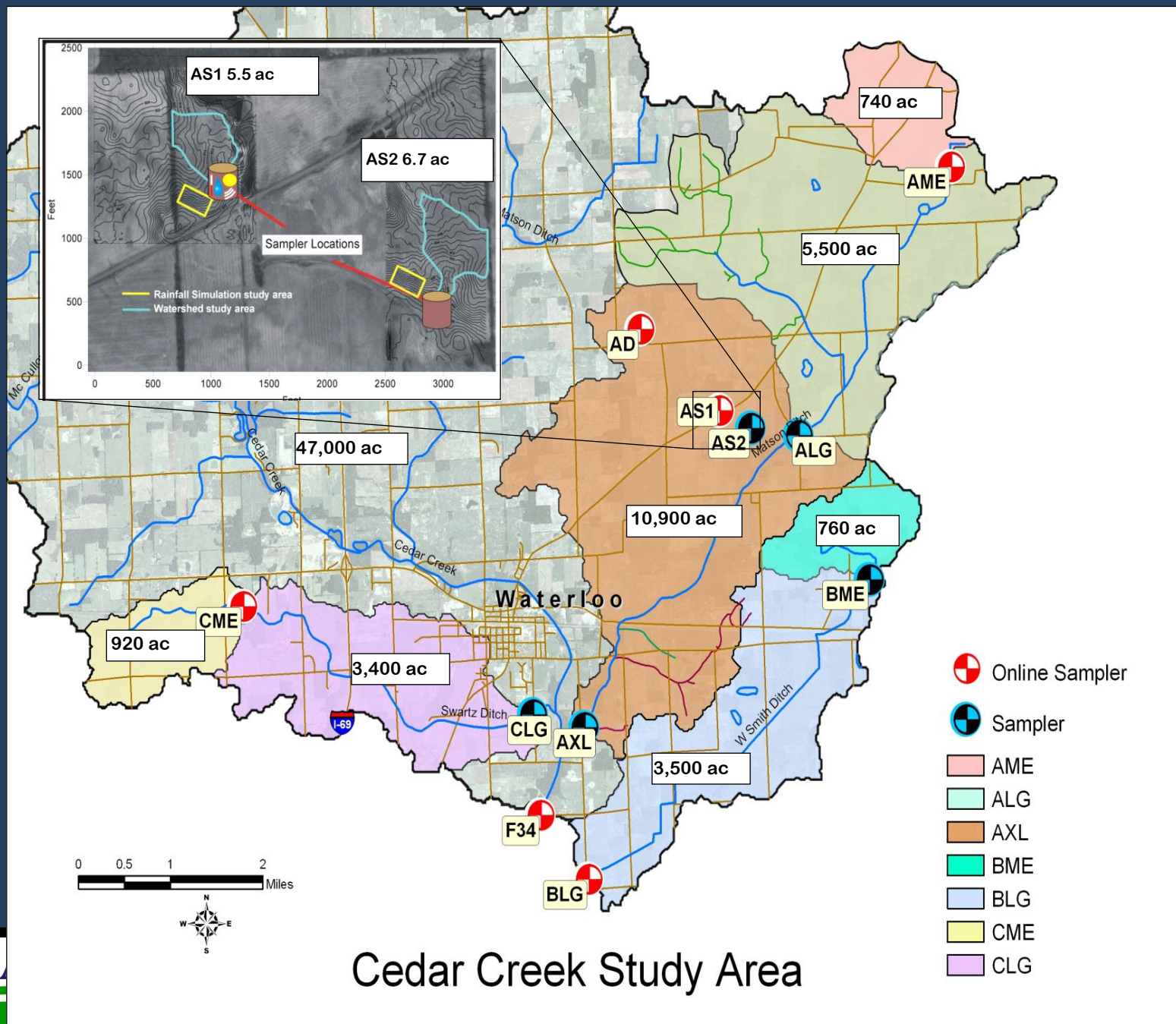
# So Why Was the St. Joseph River Selected?

- Report in the late 1990's stated that Ft. Wayne had the 2<sup>nd</sup> highest levels of Atrazine in drinking water in the US
  - Also high levels of  $\text{NO}_3\text{-N}$  in Defiance, Ohio's drinking water
  - Nutrients and sediment into Lake Erie









Cedar Creek Study Area



ditch site



7-ditch sites  
1-4<sup>th</sup> order stream

field site



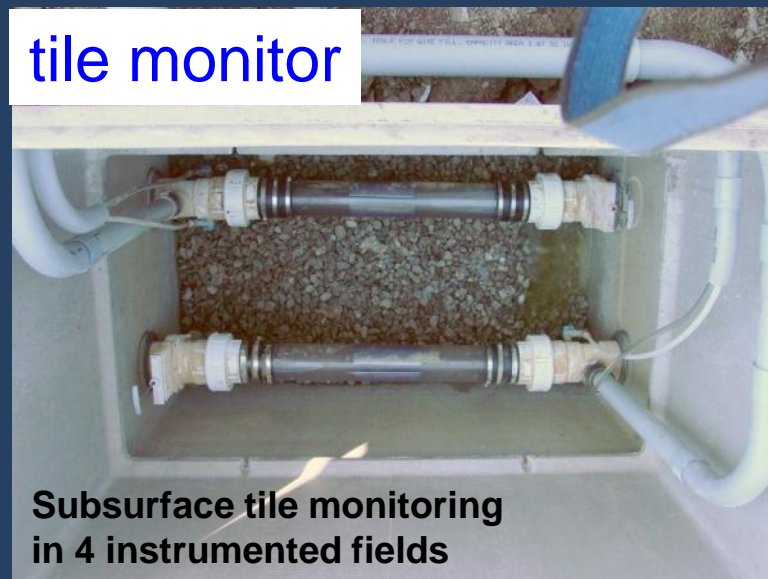
2-fields w/traditional  
runoff flowpaths

Pot-hole site



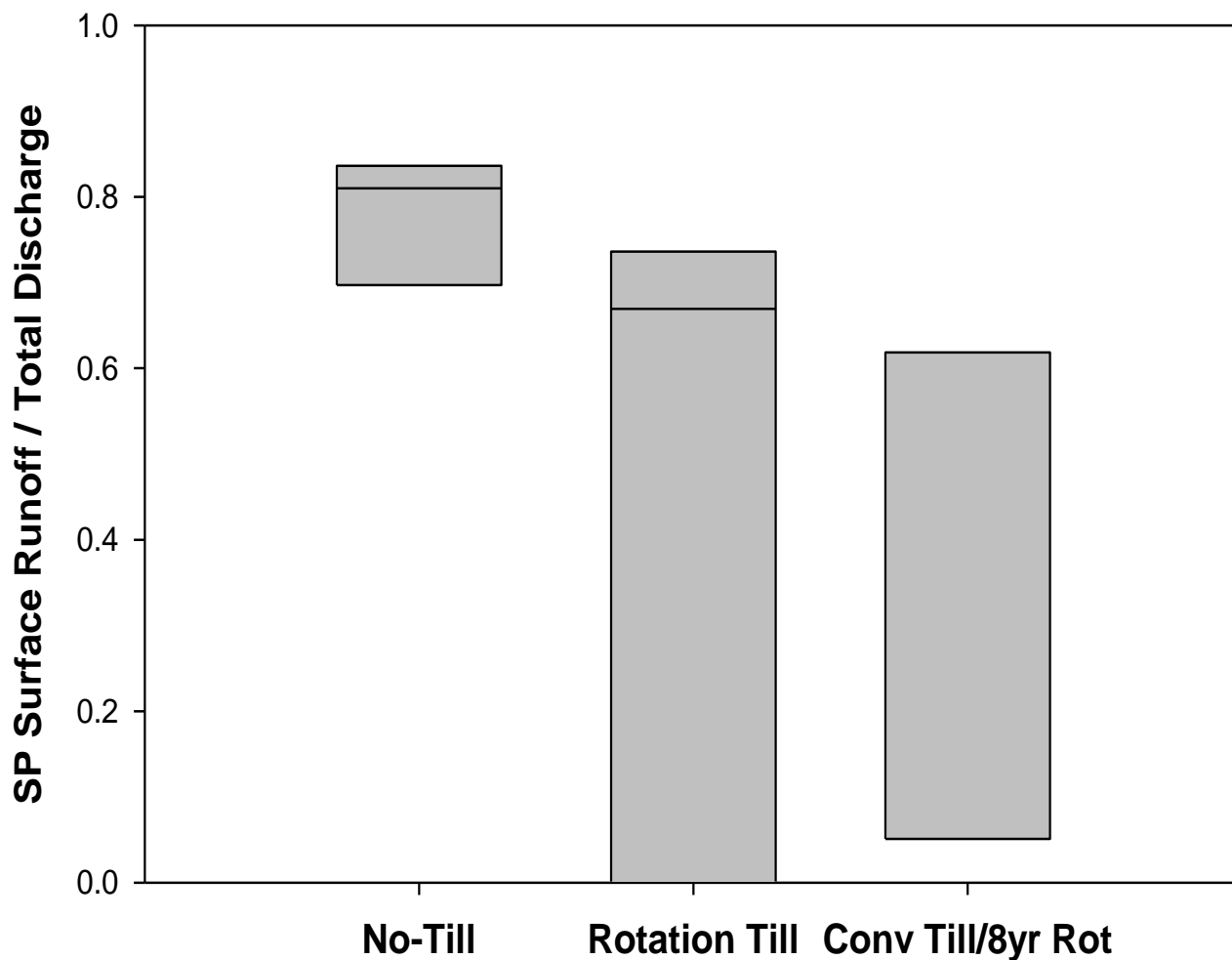
2-Potholes, unique to young  
(i.e. glacial till) landscapes

tile monitor



Subsurface tile monitoring  
in 4 instrumented fields

## SP in Surface Runoff:Total Discharge Ratio by Management



**From field scale data, roughly 50% of SP and TP leaves a field through subsurface tile**

# NSERL Real-Time Data Access Website

USDA-ARS NSERL CEAP - Mozilla Firefox

File Edit View History Bookmarks Yahoo! Tools Help

http://milford.nserl.purdue.edu/swpi/ind.php

Google

Most Visited Firefox Help Firefox Support Plug-in FAQ MSN Maps & Directions

Search Web Mail Shopping Personals My Yahoo! News Games Travel Finance Answers

## USDA-ARS National Soil Erosion Research Lab

CEAP - NW Indiana - Realtime Weather and Soil Data

[Advanced Download/Graphics](#)

[Graph Station Data](#)

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### Averages Fridge Temps + Battery

AS1, AS2, BME, BLG, and CME discharge measurements have been suspended until April 1, 2009. Precipitation measurements at AS1, A2, AME, BLG, BME, CME, and CLG have been suspended for calibration. ALG has a precipitation gauge for winter precipitation measurements.



### Sampler Averages

|                                   |          |     |      |
|-----------------------------------|----------|-----|------|
| Growing Degree Days since         | 1/1 2009 | Set | 13.4 |
| Today Precipitation(in)           |          |     | 0.00 |
| Precipitation for last 7 days(in) |          |     | 0.25 |

| Sampler             | Solar Radiation (W/m2) | Wind Speed (mph) | Wind Direction (Degrees) | Air Temperature (F) | Rain Since Midnight (inches) | Level (ft) | Velocity (ft/s) | Tile Flow (cf/s) | Last Reading         |
|---------------------|------------------------|------------------|--------------------------|---------------------|------------------------------|------------|-----------------|------------------|----------------------|
| <a href="#">AXL</a> | ---                    | 3.3              | 124 (SE)                 | 37.5                | 0.00                         | 1.47       | 2.02            | ---              | 2:50 PM EST 3/4/2009 |
| <a href="#">ALG</a> | ---                    | 7.9              | 153 (SSE)                | 37.4                | 0.00                         | 1.11       | 1.11            | ---              | 2:50 PM EST 3/4/2009 |
| <a href="#">AME</a> | 0                      | 3.2              | 162 (SSE)                | 23.77               | 0.00                         | 0.808      | 1.01            | ---              | 8:40 PM EST 3/3/2009 |
| <a href="#">AS1</a> | 456                    | 6.9              | 182 (S)                  | 37.84               | 0.00                         | ---        | ---             | 0.0015           | 2:50 PM EST 3/4/2009 |
| <a href="#">AS2</a> | ---                    | ???              | ?? (N)                   | ???                 | 0.00                         | ---        | ---             | 0.0002           | 2:50 PM EST 3/4/2009 |
| <a href="#">AD</a>  | ---                    | 12.3             | 108 (ESE)                | 37.4                | 0                            | ---        | ---             | 0.0040           | 2:50 PM EST 3/4/2009 |
| <a href="#">BLG</a> | 281                    | 8.8              | 195 (SSW)                | 37.64               | 0.00                         | ---        | ---             | ---              | 3:00 PM EST 3/4/2009 |
| <a href="#">CME</a> | 389                    | 4.2              | 168 (SSE)                | 37.64               | 0.00                         | ---        | ---             | ---              | 2:30 PM EST 3/4/2009 |

| Sampler             | Rain Since Midnight (inches) | Level (ft) | Velocity (ft/s) | Last Reading         |
|---------------------|------------------------------|------------|-----------------|----------------------|
| <a href="#">F34</a> | ---                          | 2.716      | 1.58            | 2:50 PM EST 3/4/2009 |
| <a href="#">BME</a> | 0.00                         | ---        | ---             | 2:50 PM EST 3/4/2009 |
| <a href="#">CLG</a> | 0.00                         | -2.25      | -1.64           | 2:50 PM EST 3/4/2009 |

[Statements and Disclaimers](#)

[Contact Information](#)

[AME](#)

[BLG](#)

[AS1](#)

[CME](#)

[AD](#)

[F34](#)

[ALG](#)

[AXL](#)

[CLG](#)

[BME](#)

[AS2](#)

Done

start

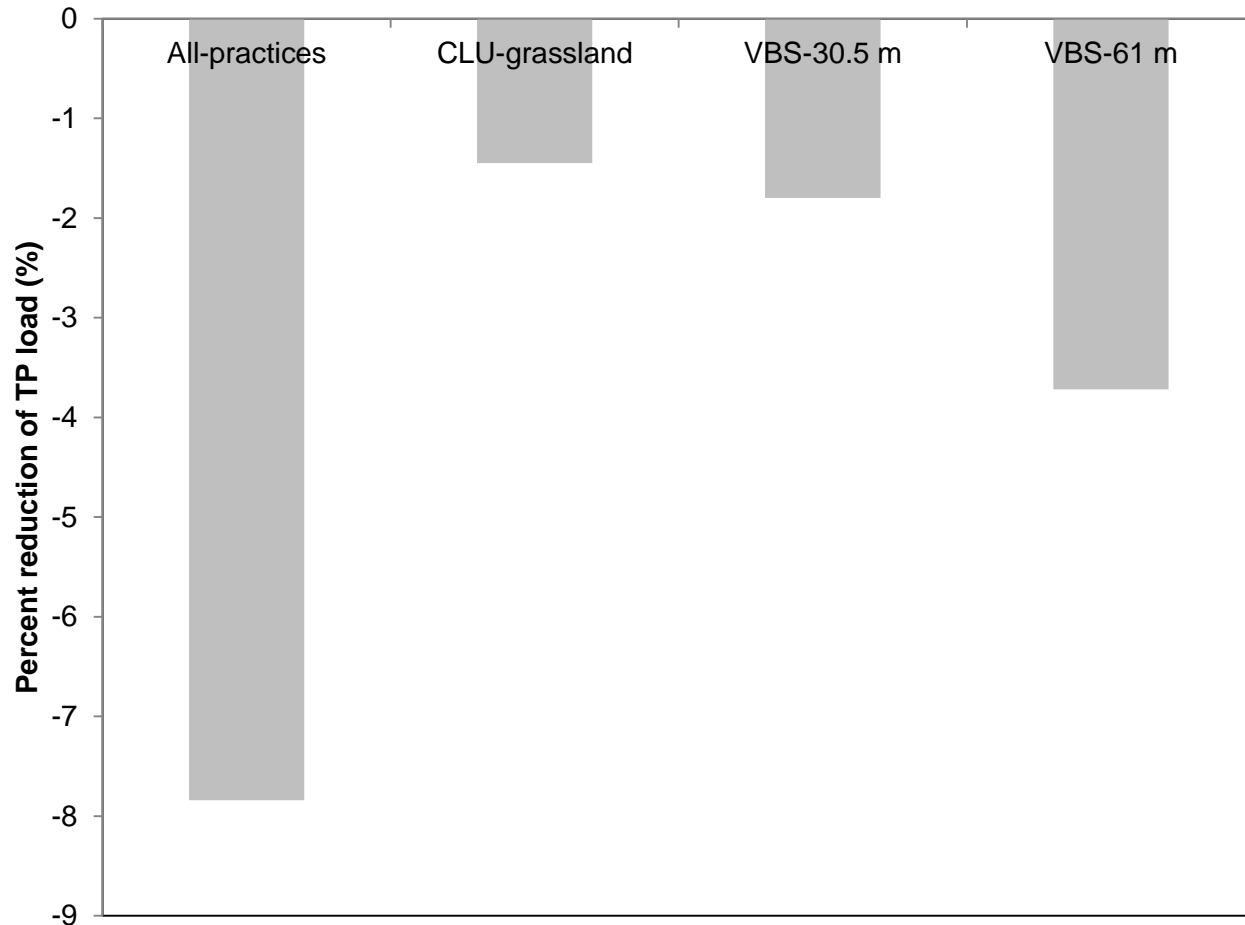
USDA-ARS N...

3:45 PM

cultural  
search  
ice



# Modeling of Buffers on TP Loads



**Modeling indicates ~8% decrease in TP Loading from buffer strips**

Courtesy Gary Heathman



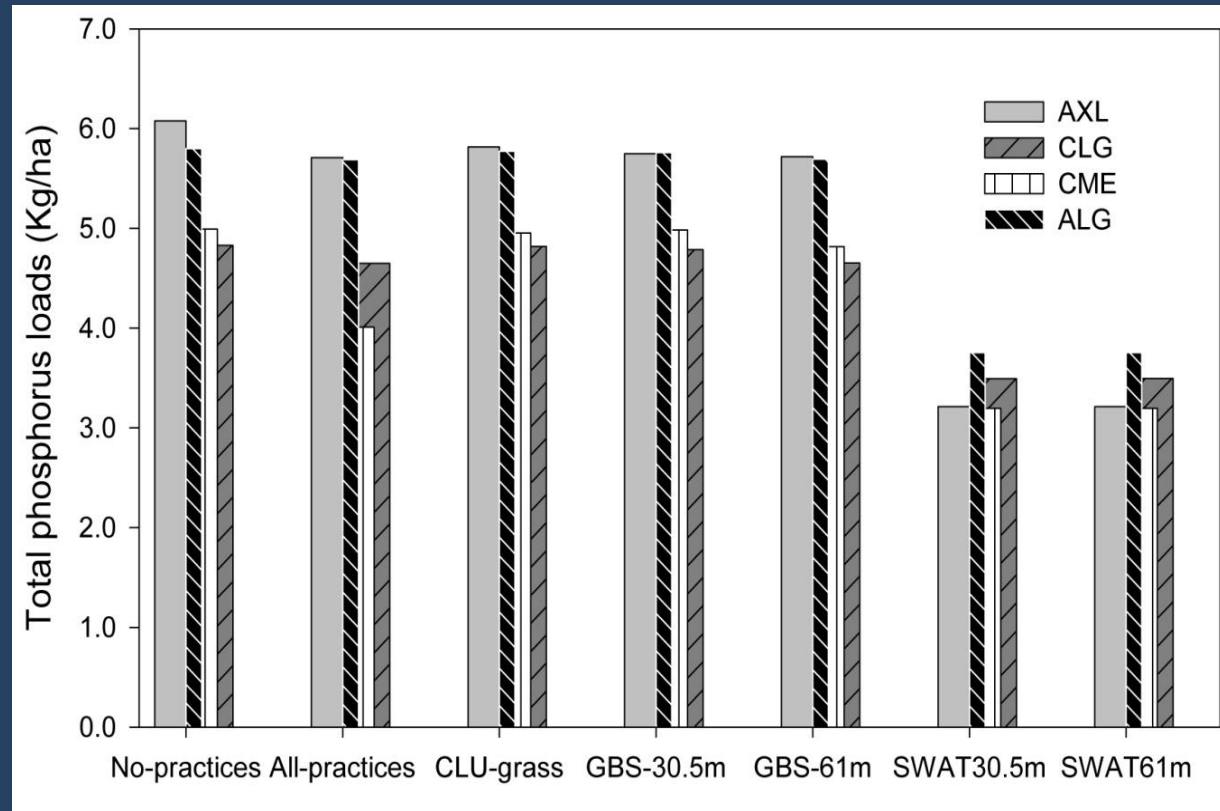
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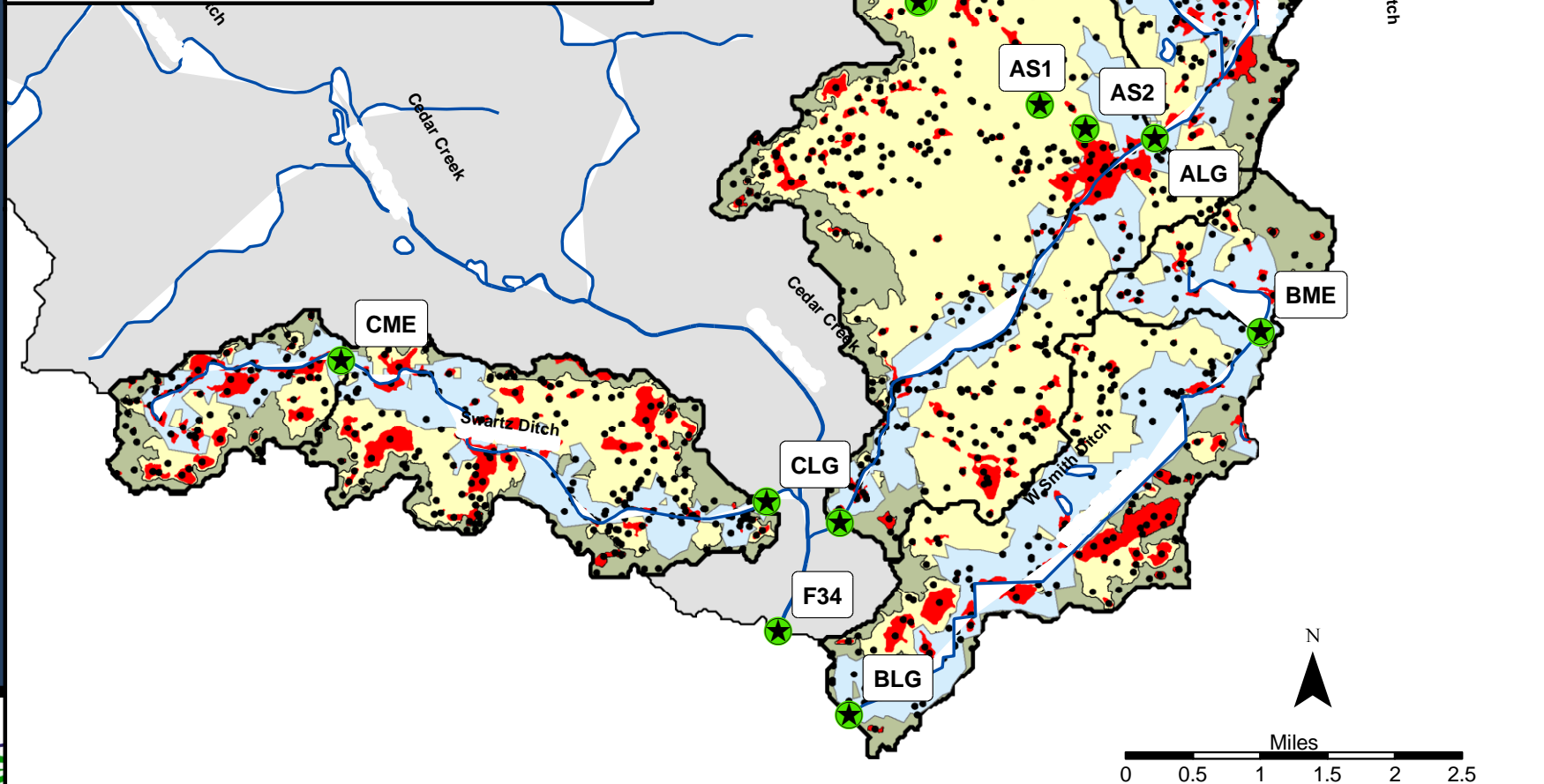
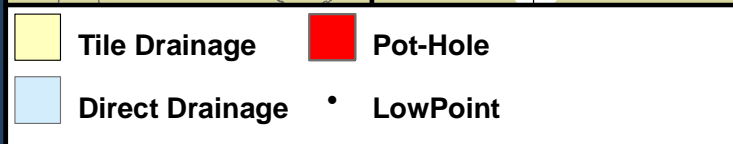
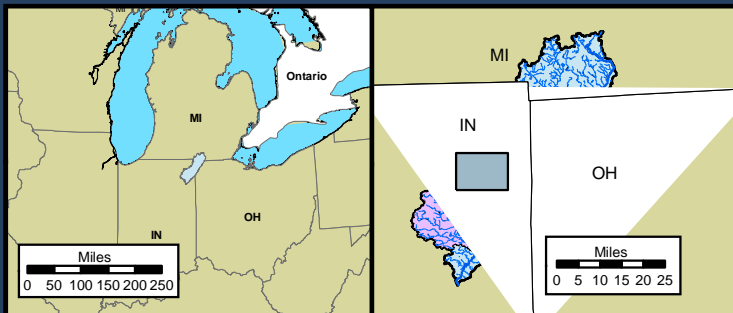


# Modeling of Buffers on TP Loads

**Modeling also suggests if all fields were buffered, could achieve ~50% decrease in TP Loading**

Courtesy Gary Heathman







# Influence of Drainage Class on Nutrient Losses



- Nutrient losses were higher from watersheds with more:
  - Direct Drainage
  - Pot-Hole Drainage

# Traditional Tile Risers





# Subsurface Tile & Tile Riser Flow

In our landscape, the hydrology has been short circuited. Dating back to the mid-1800's, settlers had to drain the land to break the sod.



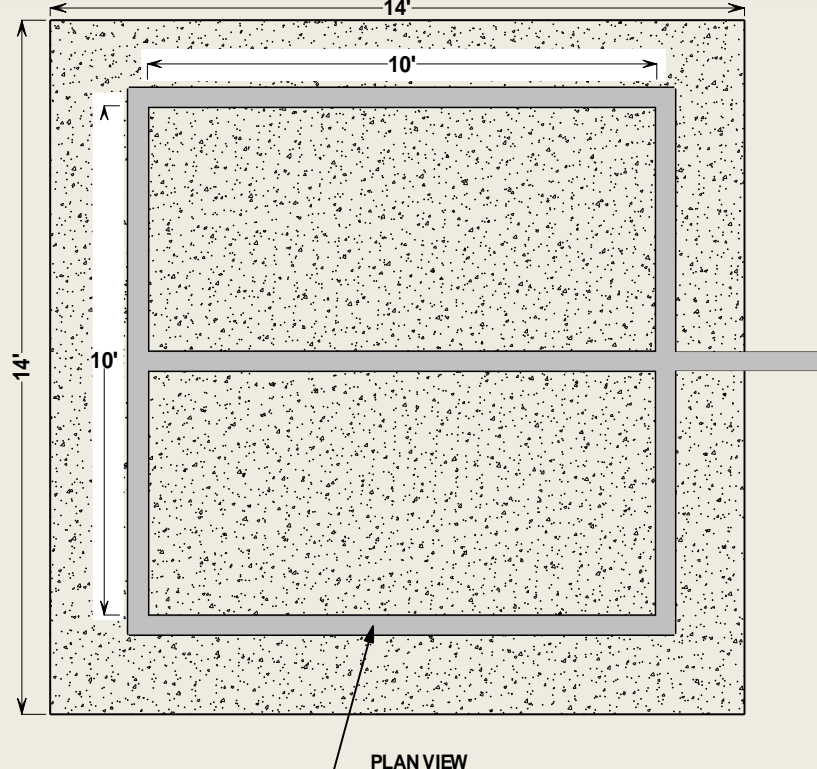
Pot-hole is  
1.85 miles  
from ditch  
(nearest point)



National Soil Erosion Res

ral



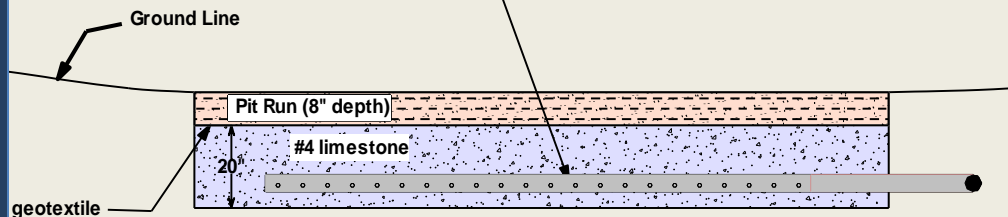


PLAN VIEW

ASTM 2729 perforated drainfield pipe  
5/8" holes positioned @ 4 and 8 o'clock

If soils are fine sands, silts or soft and unstable, use geotextile  
to line the entire excavation before placing the aggregates.

Pit Run: unsorted sand and small gravel



CROSS SECTION

## 10' x10' Blind Inlet





# Blind Inlet with riser alternate





# Percent Reductions in Sediment and Nutrient Loads: blind inlet vs tile risers

| <u>Nutrient</u>   | <u>% Reduction</u> |
|-------------------|--------------------|
| Sediment          | 79                 |
| Ammonium-N        | 59                 |
| Nitrate-N         | 24                 |
| Total Kjehldahl N | 48                 |
| Soluble P         | 72                 |
| Total P           | 78                 |

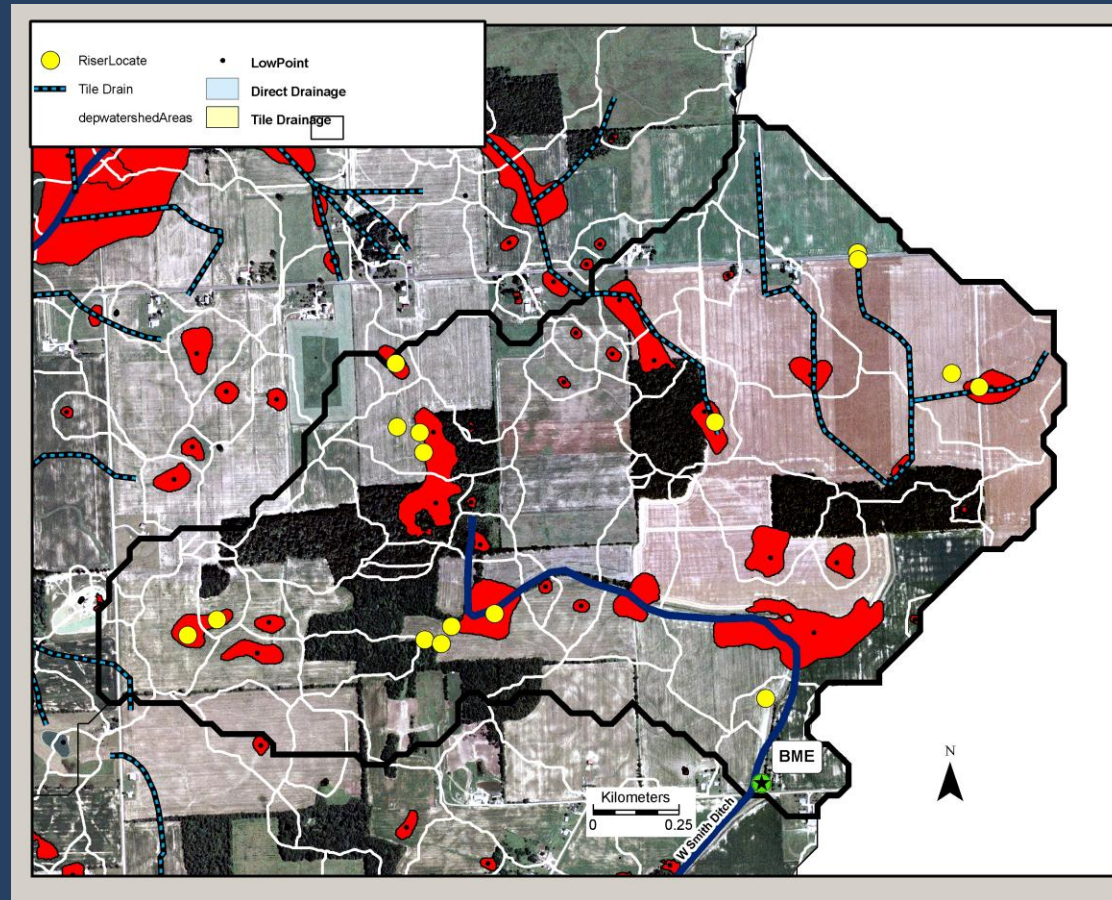


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# Watershed Scale Testing of Blind Inlets

- ✦ Continued detailed monitoring of instrumented pot-holes
- ✦ Blanketed a monitored small watershed (~300 ha) with blind inlets





Creek Chub



Johnny Darter



Cedar Creek

Central Stoneroller

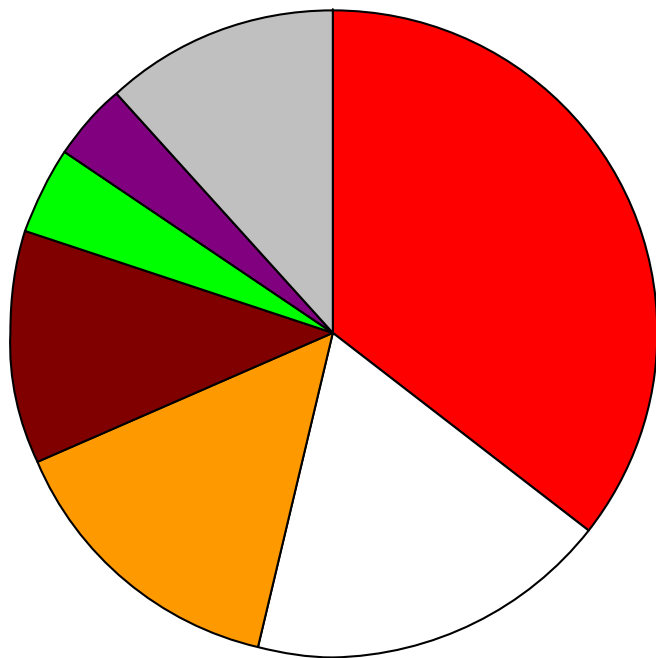


Blacknose Dace



Courtesy Bob Gillespie, IPFW





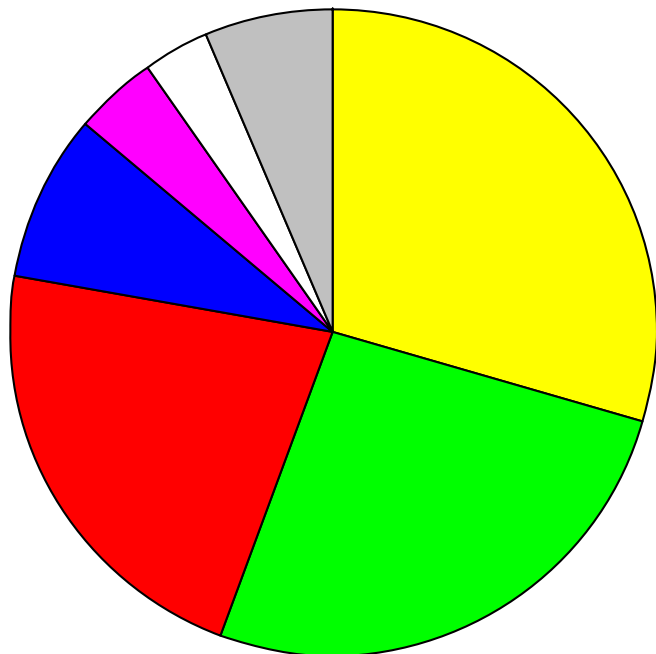
- Creek Chub
- Johnny Darter
- Central Stoneroller
- Blacknose Dace
- Bluntnose Minnow
- White Sucker
- 14 spp - 12%

## Cedar Creek

20 species from 3096 captures

79% headwater fishes

## Relative Abundance (%)



- Fathead Minnow
- Bluntnose Minnow
- Creek Chub
- Green Sunfish
- Orangethroat D.
- Johnny Darter
- 6% - 19 spp

## Upper Big Walnut Creek

25 species from 7234 captures

95% Headwater fishes

# Conclusions

- 10 yrs of WQ monitoring
- Tested conservation practices (buffers, tillage, cropping systems) through modeling and monitoring
- Identified key flow-paths and developed CP's to address one of these (tile risers)
- Partnering NASA et al. to test remote sensing technologies



# Conclusions

- Assessing in-stream habitat and fish species/abundance
- Developing partnerships to assess the potential for in-stream treatments to remove nutrients
- Working with partner groups to assess in-field nutrient management







# Questions?

Questions?



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